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body in question ; but for wave-lengths which are strongly absorbed by the given substance, Cauchy's formulæ for the intensity of metallic reflection should be used." It appears from these formulæ that the intensity of the reflected light depends on the index of refraction and on the coefficient of absorption of the substance presenting the reflecting surface. Since both these factors are different for light of different colors, it is shown that white light must be reflected with some of its "components" relatively weaker than others, *i. e.*, no longer in the proper proportion to give the sensation of white light. The application to the colors seen in the mineral kingdom is illustrated by the example of magnesium cyanplatinite,  $\text{Mg Pt (CN)}_4$ , where,—as is true of most crystals,—the index of refraction and the coefficient of absorption vary with the direction in which the light vibrates, as well as with the wave-length of the light. The extent to which true surface color is observable on minerals is not indicated, though the *possibility* of a very wide application is clearly shown.

In the appendices, certain mathematical aspects of the subject are treated in a manner suited to the requirements of physicists.—A. C. G.

**The Whence and Whither of Man.**<sup>2</sup>—This book comprises a series of lectures delivered at Union Theological Seminary, with some additional matter. The author discusses the doctrine of Evolution from the standpoint of a theologian. He endeavors to show that the great law of animal and human development as revealed in the sequence of physical and mental development is that those species survive which are best conformed to their environment ; that this law holds good in the development of the rational, the dominant faculty in man ; and finally, to become higher man he must develop a moral-nature by attaining a knowledge of himself as a moral agent, and while not disregarding the body, he must subordinate its appetites to the higher motives furnished by right and duty. It is in following this line of thought that the author hopes for a definite answer as to the future destiny of man.

The closing chapter deals with the present aspects of the theory of evolution. He here compares the various hypotheses of evolution and considers their merits. He judiciously selects the good elements of all of them, concluding that "each theory contains important truth." He concludes that Nägeli's view of "initial tendencies" is too often undervalued. "My own conviction is steadily strengthening that without

<sup>2</sup> *The Whence and Whither of Man.* By John M. Tyler, New York, 1896, Charles Scribner's Sons, Publishers.

some such original tendency or aim, evolution would never have reached its present culmination in man." He quotes Boveri that "there is too much intelligence in nature for any purely mechanical theory to be possible." It is curious that these authors do not perceive that the sensation of protoplasm, (consciousness), furnishes the basis for the exhibition of the intelligence which they observe, and which has itself undergone evolution coincidentally with the organism. Both orthodox and heterodox evolutionists (theologically speaking) seem equally slow to adopt this view.

Prof. Tyler's book is eminently moderate and reasonable, and will introduce evolution to a large class of readers in an agreeable form.

**Cope on the Factors of Organic Evolution.**<sup>3</sup>—This book is divided into three parts: I, The nature of variation; II, The causes of variation; III, The inheritance of variation. In the first part it is endeavored to show that variation is not promiscuous or multifarious, but pursues direct courses towards definite ends. This is done by presenting the variations of existing species as to color and structure, and by an examination of the series presented by the forms of vertebrate life in past geologic ages. The latter presentation is a general phylogeny of the vertebrata, with special sections on that of the horse and that of man. The second part is divided into chapters which deal with the physical energies as causes of variation, and the effects of molar motion as seen in variation. These methods of evolution are termed respectively physiogenesis and kinetogenesis. Especial attention is given to kinetogenesis in connection with the phylogeny of vertebrates, since it is in these two fields that most of the original work of the author has been done. The author has demonstrated that the primary cause which has moulded the vertebrate skeleton is molar motion. In the third part, the inheritance of the characters so produced is shown to be the rule, thus demonstrating the inheritance of acquired characters. Theories of inheritance are discussed, and that one which asserts the transmission of energies to the germ plasma is defended. These energies are believed to be the results of a composition between inherited and acquired energies, the whole of them being referred to a class distinct from the inorganic energies, which he has named Bathmic. The last chapter in this part is devoted to a consideration of the relation of consciousness to movements, and hence as a cause

<sup>3</sup> The Primary Factors of Organic Evolution, by E. D. Cope, Professor of Zoology and Comparative Anatomy in the University of Pennsylvania. Chicago: Open Court Pub. Co., Feb., 1896, \$2.00.